

## \* NOTICES \*

JPO and NCIPPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

[0001]

[Industrial Application] the circuit board, for example, a dot-matrix luminescence display, for this invention to carry electrical parts, such as light emitting diode (for it to be called Following LED), diode, a lamp, and a resistance element, on the matrix circuit board -- it is related with the matrix circuit board used when manufacturing the diode driver of the body and its function.

[0002]

[Description of the Prior Art] In this kind of matrix circuit board, as shown in drawing 5, the electrode pattern which consists of an anode, the cathode side wiring 4 (henceforth wiring 4) and a cathode, or anode side wiring 5 (henceforth wiring 5) is formed in the table of an insulating substrate 12, and hidden both sides. It connects with the surface current carrying part 10 which separated in the surface electrode 9 of the electrode which considered wiring 4 formed in the rear-face side of an insulating substrate 12 as wiring 5 by the front-face side of an insulating substrate 12 through the through hole 11, and was formed. Thus, since the circuit is formed by connecting the electrical parts 6, for example, an LED bare chip, such as diode and a resistance element, to the surface electrode 9 and the surface current carrying part 10 which were formed The driver element and drive circuit for making the components which most of both sides of the circuit board were used as a matrix circuit, and carried in this matrix circuit board drive are formed in another substrate.

[0003]

[Problem(s) to be Solved by the Invention] However, by the configuration approach of this kind of matrix circuit, since wiring used as the current carrying part on a flat surface crossed, the through hole needed to be used or jumpering chip or solid wiring by the printed conductor needed to be performed, there was a problem in the dependability of that a process becomes complicated or connection etc. moreover -- since it is usually 18 micrometers or 35 micrometers as thickness of the conductor used as a circuit -- a conductor -- if resistance is strong and the circuit as a conductor becomes long, inclination will arise in supply voltage by the voltage drop, and problems, like in the result, for example, LED, a difference appears in brightness become easy to arise.

[0004] since a glass fiber content epoxy resin substrate with mainly bad thermal conductivity is furthermore used as an insulating material as the circuit board for through holes -- a conductor -- there was a trouble which malfunction on a circuit etc. generates that it is easy to accumulate generation of heat from electrical parts, such as a circuit, carried diode, and a resistance element.

[0005] And the component for a drive and a drive circuit for this matrix circuit board to make the carried electrical part driving, since wiring of an anode or a cathode is carried out to both sides were made formed as another substrate, and also at the lowest, the two matrix circuit boards were needed, and had the fault to which the volume when assembling these also becomes large.

[0006]

[Means for Solving the Problem] As a result of examining many things as an approach for solving these problems, this invention by carrying out solid wiring to the shape of a mesh various in the condition that the metallic conductor line was insulated beforehand A circuit is formed on one [ at least ] flat surface. As an electrical part to this field LED, Diode, a lamp, a resistance element, etc. can be made to carry (henceforth an electrical part), and it came to complete header this invention for the ability of the substrate which has the component for a drive and drive circuit for making said electrical part drive to be stuck on another field.

[0007] Namely, this invention carries out mutual mesh-like solid wiring at least, where a metallic conductor line is insulated beforehand, it removes a desired insulating part, carries an electrical part in one field of the matrix circuit board to which it makes it come to expose a metallic conductor line, and connects it with said metallic conductor line. The matrix circuit board which furthermore sticks on the field of another side the substrate which has said component for an electrical-part drive, and a drive circuit, and comes to connect with said metallic conductor line, Moreover, it is characterized by the functional part in which diode, the lamp, the resistance element, etc. were carried as the plotting board which carried LED as an electrical part of this circuit board, or an electrical part.

[0008]

[Function and Example(s)] A drawing explains this invention to a detail below. (1) of drawing 1 is the perspective view of the plain-weave mesh-like solid wiring 2 which wave by turns the pre-insulation metallic conductor line 1 covered with the

insulating material of this invention as warp and the weft, and (2) is a top view which consists of a pre-insulation metallic conductor line 1 exposed when the plain-weave mesh-like solid wiring 2 is seen at a flat surface and which expresses wiring 4 and wiring 5 in drawing 2.

[0009] Moreover, drawing 2 sinks in by the insulating agent 3, and uses the clearance between the plain-weave mesh-like solid wiring 2 as the circuit board. When it sees to the shape of a mesh at the flat surface of the pre-insulation metallic conductor line 1 by which solid wiring was carried out, grind the insulating part in which the electrical part of the wiring 4 exposed to a front face and wiring 5 is carried, and a metallic conductor line is exposed. It is the side-face sectional view of the bonding pad 8 which connected the monochrome LED bare chip 6 to wiring 4 through solder, and was prepared in wiring 5, and the plotting board connected with the wire 7.

[0010] Although there is no limit in any way as the quality of the material if it is an object with small electric resistance as a metallic conductor line used for the pre-insulation metallic conductor line 1 of this invention, copper wire is suitable from the point of electric resistance and a price. And although the one thicker [ although there is especially no limit as a wire size of a metallic conductor line ] in order to make electric resistance small is good, since weaving if not much thick becomes difficult and the whole circuit also becomes large, as a size, the range of 0.01mm - 5mm is desirable for a diameter.

[0011] Moreover, resin, such as polyurethane, polyethylene, polypropylene, a formal, and ethylene tetrafluoride, is [ that what is necessary is just the quality of the material which has the flexibility which can be woven in the shape of a mesh by turns at least as a pre-insulation ingredient ] usable.

[0012] The weave of mesh-like solid wiring of this invention can change weave by the helicopter loading site of the electrical part on a plain weave, twill, and other circuits, and can also form mesh-like solid wiring. And in case they may differ even if the metallic conductor line used as warp and the weft has the same wire size, and they are woven further, even if it is a metallic conductor line about one side and is in any of whether another side is made into a pre-insulation metallic conductor line, or to make both into a pre-insulation metallic conductor line, it does not interfere.

[0013] next, since the plain-weave mesh-like solid wiring 2 used for this invention is supple, the insulating agent 3 is sunk into a gap as reinforcement -- you may make -- moreover, an electrical part and a conductor, when generation of heat from a circuit becomes a problem the resin which filled up the clearance between mesh-like solid wiring with the thermally conductive good filler as an insulating agent 3 is slushed, and it solidifies -- making existing filler restoration resin -- an electrical-part metallurgy group -- a conductor -- heat dissipation from a line circuit can be performed efficiently.

[0014] As resin used as an insulating agent 3, if engineer plastics thermoplastics, such as liquefied thermosetting resin, such as an epoxy resin and phenol resin, imide resin, and silicone resin, is used and it is a thermally conductive good object as a filler, there is especially no limit and impalpable powder, such as an aluminum oxide (alumina), aluminum nitride, boron nitride, silicon nitride, oxidization silicon, and cordierite, is used.

[0015] An electrical part can be attached at the easy process of applying for example, a pewter paste in respect of the side which carries an electrical part in the part of the metallic conductor line which this invention exposed, laying an electrical part, and performing a pewter reflow. In order to raise pewter adhesion at this time, nickel plating, gold plate, etc. may be processed for the corrosion prevention of a metallic conductor line. As a bonding pad 8 prepared in wiring 5 further, for example, gold plate, coppering, and nickel plating are used.

[0016] Next, (1) - (2) of drawing 3 and drawing 4 is the matrix circuit board which stuck the substrate which has the component for a drive and drive circuit of this invention. Carry an electrical part in wiring 4 or wiring 5, and it connects with matrix circuit board one field. The substrate 13 for a drive which has the driver element 14 and drive circuit for making said electrical part drive is stuck on the field of another side, and the drive circuit of this substrate 13 for a drive and wiring of the matrix circuit board are connected in a wire 15, a connector 16, or metal bump 17 grade.

[0017] In more detail, drawing 3 carries the LED bare chip 6 in one field of the matrix circuit board, connects with wiring 4, connects wiring 5 with the LED bare chip 6 with a wire 7 through a bonding pad 8, sticks the substrate 13 for a drive which carried the driver element 14 in the field of another side, connects wiring 4 and wiring 5, and a driver element with a wire 15, and is a thing.

[0018] Moreover, (1) of drawing 4 carries the LED bare chip 6 in one field of the matrix circuit board, it connects with wiring 4, connects wiring 5 with the LED bare chip 6 with a wire 7 through a bonding pad 8, pastes up the substrate 13 for a drive which carried the driver element 14 in the field of another side through an insulating substrate 12, and is connected by the connector 16 formed in the matrix circuit board and the substrate 13 for a drive.

[0019] And (2) of drawing 3 carries the LED bare chip 6 in one field of the matrix circuit board, it connects with wiring 4, and connects wiring 5 with the LED bare chip 6 with a wire 7 through a bonding pad 8. The substrate 13 for a drive which carried the driver element 14 in the field of another side is pasted up through the metal bump 17, and the matrix circuit board and the substrate 13 for a drive are electrically connected to the through hole (not shown) which performed conductive plating.

[0020] In case aluminum, silicon steel, carbon steel, SUS, Invar, etc. are used as the quality of the material of the substrate 13 for a drive in case heat-conduction effectiveness is gathered, and thermal conductivity is seldom needed, it does not interfere with resin plates, such as phenol resin, imide resin, and an epoxy resin,, either.

[0021] The matrix circuit board of this invention is producible by grinding the insulating material of the metallic conductor line by which the location of a request of one side or both sides which are exposed when it sees at the flat surface of a plain weave or mesh-like solid wiring which carried out twill is not insulated, and a pre-insulation metallic conductor line, and exposing a metallic conductor line. Moreover, a metallic conductor line can produce both by grinding the insulating

material of a desired location and exposing a metallic conductor line, when covered with the insulating material. [0022] And this circuit board can be reinforced by infiltrating the insulating material of a resin-like object into the clearance between mesh-like solid wiring as occasion demands, carries an electrical part in one field, and it can produce the matrix circuit board which can be used for small various applications by sticking the drive circuit for making said electrical part drive on the field of another side, without establishing a through hole in the circuit board.

[0023] Thus, this invention can manufacture the matrix circuit board easily by using various mesh-like solid wiring. The heat dissipation nature from a line circuit is also good, and the thing which the supply voltage to a metallic conductor line or an electrical part becomes stable, and is sunk [ clearance / between mesh-like solid wiring ] in in an insulating agent with good thermal conductivity -- an electrical-part metallurgy group -- a conductor -- Since electrical installation is possible, without preparing the through hole to which an electrical part is carried in one [ further ] field, the driving parts for making these drive are carried in the field of another side, and both sides are connected, it is small and production of the very reliable matrix circuit board can carry out easily.

[0024] Since the part made into the purpose of the carried electrical part as operation using these descriptions of the matrix circuit board of this invention can be made to drive statically or dynamically, if LED and a lamp are carried, for example, it can be used as a display board, and if a resistance element is carried, it can be used as a board circuit for printing to a thermal paper.

[0025] Furthermore, an example explains this invention concretely.

example 1 polyurethane resin -- copper wire with a diameter of 0.5mm -- covering -- the pre-insulation metallic conductor line 1 -- making -- this conductor -- it put on the copper plate with a thickness of 0.3mm which wove the line 1 in the shape of a mesh at intervals of 2mm, considered as the plain-weave mesh-like solid wiring 2, and applied the release agent by making this into a mold release plate. Next, the liquefied epoxy resin (the product made from oil-ized Shell: a trade name, Epicoat 807) filled up with the alumina impalpable powder of 50 capacity % as an insulating agent 3 was slushed and stiffened to extent which the solid wiring intersection section front face of the pre-insulation metallic conductor line 1 exposes, and the substrate was produced. After an epoxy resin's hardening this substrate, the mold release plate was removed, it ground until copper wire exposed with abrasives the pre-insulation metallic conductor line 1 exposed to both sides, and the matrix circuit board was obtained. The LED bare chip 6 bottom was connected to wiring 4 by soldering at the required part of one field of the copper wire which the matrix circuit board exposed, and the bottom was connected to wiring 5 by wire bonding. Wiring 4 and wiring 5 of a driver element 14 and the matrix circuit board which pasted up the substrate 13 for a drive which furthermore becomes the field of another side from a glass epoxy resin with the component for a drive and drive circuit for an LED drive with epoxy system resin adhesives on the part except the electrical connection of a drive circuit and the matrix circuit board, and were prepared in the substrate 13 for a drive were electrically connected with the wire 15, and the module for the LED display with a matrix circuit was produced.

[0026] Except having used without covering one copper wire of the example 2 plain-weave mesh-like solid wiring 2, the same actuation as an example 1 was performed, and the LED display module was produced.

[0027] Except having used the ARUMIBE-SU substrate as the quality of the material of the example 3 drive circuit board, the same actuation as an example 1 was performed, and the LED display module was produced.

[0028] Except having changed to the LED bare chip 6 of example 4 example 1, and having carried the resistance element in the matrix circuit board, the same actuation as an example 1 was performed, and the functional part as a board circuit for printing to a thermal paper was produced.

[0029]

[Effect of the Invention] According to this invention, as the above the matrix circuit board Can make having no through hole etc. and easily and, moreover, heat dissipation nature of this circuit board improves by sinking in a filler. By moreover, the thing for which electric resistance is made small and sticks a drive circuit on a rear face further rather than the copper foil circuit usually used by enlarging the diameter of the copper wire which is a metallic conductor line For example, as the matrix circuit board for LED display boards, it is cheap, the variation in brightness is small, and, moreover, heat dissipation nature can obtain the functional part as the good and small module for an LED display, or a board circuit for printing.

---

[Translation done.]

**\* NOTICES \***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**DESCRIPTION OF DRAWINGS**

---

**[Brief Description of the Drawings]**

Drawing 1 (1) of drawing 1 is the perspective view of plain-weave mesh-like solid wiring which wove the pre-insulation metallic conductor line by turns, and (2) is a top view showing wiring which consists of each of the pre-insulation metallic conductor line exposed when plain-weave mesh-like solid wiring is seen at a flat surface.

Drawing 2 Drawing 2 expresses the side-face sectional view of the plotting board which pasted up the monochrome LED bare chip on wiring to mesh-like solid wiring.

Drawing 3 Drawing 3 is the side-face sectional view of the module for an LED display which carried the LED bare chip in the front face of the matrix circuit board, stuck the substrate for an LED drive on the rear face, and was electrically connected with the wire.

Drawing 4 each of an example which performed the example for which (1) of drawing 4 made connection with the wire of drawing 3 with the connector, and (2) by the metal bump -- it is a side-face sectional view.

Drawing 5 Drawing 5 is a side-face sectional view showing the conventional plotting board.

**[Description of Notations]**

1 Pre-insulation Metallic Conductor Line

2 Plain-Weave Mesh-like Solid Wiring

3 Insulating Agent

4 Anode or Cathode Side Wiring

5 Cathode or Anode Side Wiring

6 Light Emitting Diode Bare Chip

7 Wire

8 Bonding Pad

9 Surface Electrode

10 Surface Current Carrying Part

11 Through Hole

12 Insulating Substrate

13 Substrate for Drive

14 Driver Element

15 Wire

16 Connector

17 Metal Bump

---

[Translation done.]

## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

## [Claim(s)]

[Claim 1] The matrix circuit board which carries out mutual mesh-like solid wiring at least where a metallic conductor line is insulated beforehand, removes a desired insulating part, carries an electrical part in one field of the matrix circuit board to which it makes it come to expose a metallic conductor line, connects with said metallic conductor line, sticks on the field of another side further the substrate which has said component for an electrical-part drive, and a drive circuit, and comes to connect with said metallic conductor line.

[Claim 2] The matrix circuit board according to claim 1 which makes an insulating agent come to sink into the clearance between mesh-like solid wiring.

[Claim 3] The plotting board characterized by the electrical part carried in the matrix circuit board according to claim 1 being light emitting diode.

[Claim 4] The functional part characterized by the electrical parts which carried out dressmaking to the matrix circuit board according to claim 1 being diode, a lamp, a resistance element, etc.

---

[Translation done.]

DERWENT-ACC-NO: 1995-028426

DERWENT-WEEK: 199504

COPYRIGHT 2005 DERWENT INFORMATION LTD

TITLE: Matrix circuit substrate without through-holes e.g.  
for

LED display - has mesh type wiring network covered

with

resin insulations, and which is partly exposed,

attached

components and drive element on lower substrate

surface

NoAbstract

PATENT-ASSIGNEE: DENKI KAGAKU KOGYO KK[ELED]

PRIORITY-DATA: 1991JP-0262590 (September 17, 1991)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES
MAIN-IPC			
JP 06314863 A	November 8, 1994	N/A	006
H05K 001/02			

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-
DATE			
JP 06314863A	N/A	1991JP-0262590	
September 17, 1991			

INT-CL (IPC): H01L033/00, H05K001/02

ABSTRACTED-PUB-NO: JP 06314863A

EQUIVALENT-ABSTRACTS:

**CHOSEN-DRAWING: Dwg.2/5**

**TITLE-TERMS: MATRIX CIRCUIT SUBSTRATE THROUGH HOLE LED  
DISPLAY MESH TYPE WIRE**

**NETWORK COVER RESIN INSULATE EXPOSE ATTACH  
COMPONENT DRIVE ELEMENT**

**LOWER SUBSTRATE SURFACE NOABSTRACT**

**ADDL-INDEXING-TERMS:**

**DIODE DRIVER**

**DERWENT-CLASS: U12 V04**

**EPI-CODES: U12-A01A3; V04-Q05;**

**SECONDARY-ACC-NO:**

**Non-CPI Secondary Accession Numbers: N1995-022417**

DERWENT-ACC-NO: 1982-J6864E

DERWENT-WEEK: 198229

COPYRIGHT 2005 DERWENT INFORMATION LTD

TITLE: Semiconductor display device mfr. - uses  
semiconductor

light-emitting characteristic to change picture  
formation

method and eliminate light emitter-wiring junction

PATENT-ASSIGNEE: SUWA SEIKOSHA KK[SUWA]

PRIORITY-DATA: 1980JP-0171127 (December 4, 1980)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES
--------	----------	----------	-------

MAIN-IPC

JP 57095682 A

June 14, 1982

N/A

009

N/A

INT-CL (IPC): H01L033/00

ABSTRACTED-PUB-NO:

EQUIVALENT-ABSTRACTS:

TITLE-TERMS: SEMICONDUCTOR DISPLAY DEVICE MANUFACTURE

SEMICONDUCTOR LIGHT EMIT

CHARACTERISTIC CHANGE PICTURE FORMATION METHOD

ELIMINATE LIGHT

EMITTER WIRE JUNCTION

DERWENT-CLASS: U12

PAT-NO: JP406314863A

DOCUMENT-IDENTIFIER: JP 06314863 A

TITLE: MATRIX CIRCUIT BOARD

PUBN-DATE: November 8, 1994

INVENTOR-INFORMATION:

NAME

SAWA, HIROAKI

YOKOYAMA, YOSHIHIRO

KATO, KAZUO

ASSIGNEE-INFORMATION:

NAME COUNTRY

DENKI KAGAKU KOGYO KK N/A

APPL-NO: JP03262590

APPL-DATE: September 17, 1991

INT-CL (IPC): H05K001/02, H01L033/00

US-CL-CURRENT: 439/675

ABSTRACT:

PURPOSE: To facilitate the process and increase the reliability on connection by mounting electric components on one side of a matrix circuit board and connecting them to a metallic conductor line, and sticking a substrate, which has an electric component driving element and a

drive circuit,  
to the other side and connecting it to the metallic conductor line.

CONSTITUTION: An LED bare chip 6 is mounted on one side of a  
matrix circuit

board, and it is connected with a wiring 4, and the LED bare chip 6  
and the

wiring 5 are connected with each other therouhg a bonding pad 8 by  
means of a

wire 7. A substrate 13 for driving loaded with a drive element is  
stuck to the

other side, and the wirings 4 and 5 and the drive element 14 are  
connected with

each other by a wire 15. The manufacture of the matrix circuit  
board can be

easily performed, by using a mesh-shaped three-dimensional wiring.  
Moreover,

the electric wiring can be made without providing a through hole to  
connect

both, so a small and highly reliable matrix circuit board can be

made easily.

COPYRIGHT: (C)1994,JPO

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開平6-314863

(43)公開日 平成6年(1994)11月8日

(51)Int.Cl.<sup>5</sup>

H 05 K 1/02  
H 01 L 33/00

識別記号 庁内整理番号

M 8824-4E  
H 7376-4M

F I

技術表示箇所

審査請求 未請求 請求項の数4 FD (全6頁)

(21)出願番号

特願平3-282590

(22)出願日

平成3年(1991)9月17日

(71)出願人 000003296

電気化学工業株式会社

東京都千代田区有楽町1丁目4番1号

(72)発明者 澤 博昭

東京都町田市旭町3丁目5番1号 電気化学工業株式会社総合研究所内

(72)発明者 横山 由廣

東京都町田市旭町3丁目5番1号 電気化学工業株式会社総合研究所内

(72)発明者 加藤 和男

東京都町田市旭町3丁目5番1号 電気化

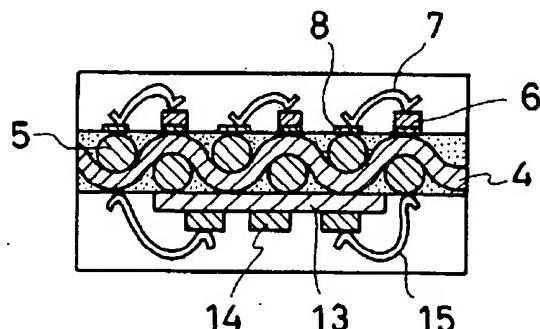
学工業株式会社総合研究所内

(54)【発明の名称】 マトリックス回路基板

(57)【要約】

【目的】 マトリックス回路基板でスルーホールや立体印刷回路を用いないで、しかも駆動素子及び駆動回路を同時に形成する。

【構成】 樹脂状絶縁物で被覆された網目状立体配線の一部を露出させて導体線回路として発光ダイオード、ランプ及び抵抗素子等の電気部品を搭載し、さらに回路基板の裏面に貼着した駆動用基板の駆動素子と露出された残りの導体線回路を使用して電気的に接続する。



1

## 【特許請求の範囲】

【請求項1】金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板の一方の面に電気部品を搭載して前記金属導体線と接続し、さらに他方の面に前記電気部品駆動用素子及び駆動回路を有する基板を貼着して前記金属導体線と接続してなるマトリックス回路基板。

【請求項2】網目状立体配線の隙間に絶縁剤を含浸させてなる請求項1記載のマトリックス回路基板。

【請求項3】請求項1記載のマトリックス回路基板に搭載した電気部品が発光ダイオードであることを特徴とする表示板。

【請求項4】請求項1記載のマトリックス回路基板に洋裁した電気部品がダイオード、ランプ及び抵抗素子等であることを特徴とする機能部品。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明はマトリックス回路基板上に発光ダイオード（以下LEDという）、ダイオード、ランプ及び抵抗素子などの電気部品を搭載するための回路基板、例えばドットマトリックス発光表示体用のダイオードドライバーを製造する場合に使用されるマトリックス回路基板に関する。

## 【0002】

【従来の技術】この種のマトリックス回路基板においては、図5に示すように絶縁基板12の表と裏の両面にアノードまたはカソード側配線4（以下配線4という）とカソードまたはアノード側配線5（以下配線5という）からなる電極パターンを形成し、絶縁基板12の裏面側に形成された配線4をスルーホール11を介して絶縁基板12の表面側で配線5とした電極の表面電極9とは分離して形成した表面導電部10に接続し、このようにして形成した表面電極9と表面導電部10とにダイオード及び抵抗素子等の電気部品、例えばLEDペアチップ6を接続することにより回路を形成しているために、回路基板の両面のほとんどがマトリックス回路として使用されて該マトリックス回路基板に搭載した部品を駆動させる為の駆動素子や駆動回路は別基板に形成される。

## 【0003】

【発明が解決しようとする課題】しかし、この種のマトリックス回路の構成方法では、平面上での導電部となる配線が交差するために、スルーホールを用いるかジャンパー・チップあるいは印刷導体による立体配線を行う必要があるので、工程が複雑になるばかりか接続の信頼性等に問題があった。また回路として用いられる導体の厚みとしては通常18μm若しくは35μmなので導体抵抗が大きく、導体としての回路が長くなると電圧降下により供給電圧に勾配が生じ、その結果例えばLEDにおいては輝度に差が出るなどの問題が起り易くなる。

2

【0004】さらにスルーホール用回路基板としては、絶縁材料として主に熱伝導性が悪いガラス繊維含有エポキシ樹脂基板が用いられるので、導体回路や搭載したダイオードや抵抗素子等の電気部品からの発熱が蓄積しやすく回路上での誤動作などが発生する問題点があった。

【0005】そして該マトリックス回路基板は、両面にアノードまたはカソードの配線が行われているので、搭載された電気部品を駆動させるための駆動用素子及び駆動回路は別基板として形成させることになり、マトリックス回路基板は最低でも2枚必要になり、これらを組み立てた時の体積も大きくなる欠点があった。

## 【0006】

【課題を解決するための手段】本発明は、これらの問題を解決するための方法として種々検討した結果、金属導体線を予め絶縁された状態で種々の網目状に立体配線することにより、少なくとも一方の平面上で回路を形成してこの面に電気部品としてLED、ダイオード、ランプ及び抵抗素子等（以下電気部品という）を搭載させることができ、もう一方の面に前記電気部品を駆動させる為の駆動用素子と駆動回路を有する基板を貼着できることを見出し本発明を完成するに至った。

【0007】すなわち本発明は、金属導体線を予め絶縁された状態で少なくとも交互網目状立体配線して所望の絶縁部分を除去して金属導体線を露出させてなるマトリックス回路基板の一方の面に電気部品を搭載して前記金属導体線と接続し、さらに他方の面に前記電気部品駆動用素子及び駆動回路を有する基板を貼着して前記金属導体線と接続してなるマトリックス回路基板、また該回路基板の電気部品としてLEDを搭載した表示板又は電気部品としてダイオード、ランプ及び抵抗素子等を搭載した機能部品を特徴とするものである。

## 【0008】

【作用及び実施例】以下図面により本発明を詳細に説明する。図1の(1)は、本発明の絶縁材料で被覆された絶縁被覆金属導体線1を縦糸と横糸として交互に織った平織り網目状立体配線2の斜視図であり、(2)は、平織り網目状立体配線2を平面で見た際に露出される絶縁被覆金属導体線1からなる、図2において配線4と配線5を表す平面図である。

【0009】また図2は、平織り網目状立体配線2の隙間を絶縁剤3で含浸して回路基板とし、網目状に立体配線された絶縁被覆金属導体線1の平面で見た際に、表面に露出される配線4と配線5の電気部品を搭載する絶縁部分を研磨して金属導体線を露出させ、配線4に半田を介して単色LEDペアチップ6を接続し、配線5に設けたボンディングパット8とワイヤー7で結線した表示板の側面断面図である。

【0010】本発明の絶縁被覆金属導体線1に用いる金属導体線としては、電気抵抗の小さい物なら材質として何ら制限はないが、電気抵抗及び価格の点から銅線が適

している。そして金属導体線の線径としては特に制限はないが、電気抵抗を小さくするためには太い方が良いが、あまり太いと織るのが困難になり、また回路全体も大きくなるので太さとしては直径で0.01mm～5mmの範囲が好ましい。

【0011】また絶縁被覆材料としては、少なくとも交互に網目状に織ることのできる柔軟性を有する材質であれば良く、ポリウレタン、ポリエチレン、ポリプロピレン、ホルマール及び4フッ化エチレンなどの樹脂が使用可能である。

【0012】本発明の網目状立体配線の織り方は、平織り、綾織り及びその他の回路上の電気部品の搭載位置により織り方を変えて網目状立体配線を形成することもできる。そして縦糸と横糸として用いる金属導体線は、線径が同一でも異なっていてもよく、さらに織る際に一方を金属導体線で、他方を絶縁被覆金属導体線とするか、又は両方を絶縁被覆金属導体線とするかのいづれかであっても差支えない。

【0013】次に本発明に用いる平織り網目状立体配線2は柔軟性があるため補強として間際に絶縁剤3を含浸させてもよく、また電気部品や導体回路からの発熱が問題になる時は、網目状立体配線の隙間に絶縁剤3として熱伝導性のよいフィラーを充填した樹脂を流し込み固化させて、既フィラー充填樹脂により電気部品や金属導体線回路からの放熱を効率よく行うことができる。

【0014】絶縁剤3として用いる樹脂としては、エポキシ樹脂及びフェノール樹脂等の液状熱硬化性樹脂、イミド樹脂、シリコーン樹脂等のエンジニアプラスチックス熱可塑性樹脂が用いられ、またフィラーとしては、熱伝導性の良い物なら特に制限はなく、酸化アルミニウム(アルミナ)、窒化アルミニウム、窒化硼素、窒化珪素、酸化珪素及びコーチェライト等の微粉末が用いられる。

【0015】本発明の露出した金属導体線の部分には、電気部品を搭載する側の面では例えばハンダペーストを塗布して電気部品を載置してハンダリフローを行うという簡単な工程で電気部品の取り付けが行える。この時ハンダ付着性を上げるために又は金属導体線の腐食防止のためにニッケルメッキ及び金メッキなどの処理を行っても良い。さらに例えば配線5に設けるボンディングパッド8としては、金メッキ、銅メッキ及びニッケルメッキが使用される。

【0016】次に図3及び図4の(1)～(2)は、本発明の駆動用素子及び駆動回路を有する基板を貼着したマトリックス回路基板であり、マトリックス回路基板一方の面に電気部品を配線4又は配線5に搭載して接続し、他方の面には前記電気部品を駆動させるための駆動素子14及び駆動回路を有する駆動用基板13が貼着され、該駆動用基板13の駆動回路とマトリックス回路基板の配線とは、ワイヤー15、コネクター16または金

属バンプ17等で接続される。

【0017】さらに詳しく図3は、マトリックス回路基板の一方の面にLEDペアチップ6を搭載して配線4と接続してボンディングパッド8を介してワイヤー7でLEDペアチップ6と配線5を接続し、他方の面には、駆動素子14を搭載した駆動用基板13を貼着し、配線4及び配線5と駆動素子とをワイヤー15で接続したものである。

【0018】また図4の(1)は、マトリックス回路基板の一方の面にLEDペアチップ6を搭載して配線4と接続してボンディングパッド8を介してワイヤー7でLEDペアチップ6と配線5を接続し、他方の面には、駆動素子14を搭載した駆動用基板13を絶縁基板12を介して接着し、マトリックス回路基板と駆動用基板13に設けられたコネクター16によって接続されている。

【0019】そして図3の(2)は、マトリックス回路基板の一方の面にLEDペアチップ6を搭載して配線4と接続してボンディングパッド8を介してワイヤー7でLEDペアチップ6と配線5を接続し、他方の面には、駆動素子14を搭載した駆動用基板13を金属バンプ17を介して接着し、マトリックス回路基板と駆動用基板13は、導電性メッキを施したスルーホール(図示せず)に電気的に接続されている。

【0020】駆動用基板13の材質としては、熱伝導効率をあげる際には、例えばアルミニウム、珪素鋼、炭素鋼、SUS及びインバー等が用いられ、また熱伝導性をあまり必要としない際にはフェノール樹脂、イミド樹脂及びエポキシ樹脂等の樹脂板でも差支えない。

【0021】本発明のマトリックス回路基板は、例えば平織り又は綾織りした網目状立体配線の平面で見た際に露出する、片面又は両面の所望の位置の絶縁されていない金属導体線及び絶縁被覆金属導体線の絶縁材料を研磨して金属導体線を露出させることにより作製することができる。また金属導体線が両方も絶縁材料で被覆されている際は、所望の位置の絶縁材料を研磨して金属導体線を露出させることにより作製することができる。

【0022】そしてこの回路基板は、必要により網目状立体配線の隙間に樹脂状物の絶縁物を含浸させることにより補強できるし、一方の面には電気部品を搭載し、他方の面には前記電気部品を駆動させるための駆動回路を貼着することで、回路基板にスルーホールを設けることもなく小型で種々の用途に使用できるマトリックス回路基板を作製することができる。

【0023】このように本発明は、種々の網目状立体配線を用いることによりマトリックス回路基板の製造が簡単にえ、しかも金属導体線や電気部品への供給電圧が安定となり、網目状立体配線の隙間に熱伝導性良好な絶縁剤を含浸することにより電気部品や金属導体線回路からの放熱性もよく、さらに一方の面には電気部品を搭載し、他方の面にはこれらを駆動させるための駆動部品を

搭載して両面を結ぶスルーホールを設けることなく電気的接続ができるので、小型で極めて信頼性の高いマトリックス回路基板の作製が容易に行うことができる。

【0024】これらの特徴を利用した本発明のマトリックス回路基板の使用方法としては、搭載した電気部品の目的とする部分をスタティック又はダイナミックにドライブさせることができるので、例えばLEDやランプを搭載すれば表示板として使用でき、抵抗素子を搭載すれば感熱紙への印字用ボード回路として使用することができる。

【0025】さらに実施例により本発明を具体的に説明する。

#### 実施例1

ポリウレタン樹脂で直径0.5mmの銅線を被覆して絶縁被覆金属導体線1を作り、この導体線1を2mm間隔で網目状に纏って平織り網目状立体配線2とし、これを離型板として離型剤を塗布した厚み0.3mmの銅板にのせた。次に絶縁剤3として50容量%のアルミナ微粉末を充填した液状エポキシ樹脂（油化シェル（株）製：商品名、エピコート807）を絶縁被覆金属導体線1の立体配線交点部表面が露出する程度まで流し込み硬化させ基板を作製した。この基板をエポキシ樹脂が硬化後に離型板を剥し、両面に露出している絶縁被覆金属導体線1を研磨材で銅線が露出するまで研磨してマトリックス回路基板を得た。マトリックス回路基板の露出した銅線の一方の面の必要な部分にLEDペアチップ6の下側を半田付けにより配線4に接続し上側をワイヤーボンディングにより配線5に接続した。さらに他方の面にはLED駆動用の駆動用素子と駆動回路を有したガラスエポキシ樹脂よりなる駆動用基板13を駆動回路とマトリックス回路基板との電気接続部を除く部分にエポキシ系樹脂接着剤で接着して駆動用基板13に設けた駆動素子14とマトリックス回路基板の配線4及び配線5とをワイヤー15で電気的に接続してマトリックス回路付きLED表示用モジュールを作製した。

#### 【0026】実施例2

平織り網目状立体配線2の一方の銅線を被覆しないで用いた以外は、実施例1と同様な操作を行いLED表示モジュールを作製した。

#### 【0027】実施例3

駆動回路基板の材質としてアルミベース基板を用いた以外は実施例1と同様な操作を行いLED表示モジュールを作製した。

#### 【0028】実施例4

実施例1のLEDペアチップ6に替えて抵抗素子をマトリックス回路基板に搭載した以外は、実施例1と同様な操作を行い感熱紙への印字用ボード回路としての機能部品を作製した。

#### 【0029】

【発明の効果】以上とおり本発明によればマトリックス回路基板は、スルーホール等無しで容易に作ることができ、しかも該回路基板はフィラーを含浸することで放熱性が向上し、また金属導体線である銅線の直径を大きくすることで通常用いられる銅箔回路よりも電気抵抗が小さくなり、さらに駆動回路を裏面に貼着することで、例えばLED表示板用のマトリックス回路基板として、安価で輝度のバラツキが小さく、しかも放熱性が良好で小型なLED表示用モジュールや印字用ボード回路としての機能部品を得ることができる。

#### 【図面の簡単な説明】

【図1】図1の(1)は、絶縁被覆金属導体線を交互に纏った平織り網目状立体配線の斜視図であり、(2)は、平織り網目状立体配線を平面で見た際に露出される絶縁被覆金属導体線の各々からなる配線を表す平面図である。

【図2】図2は、網目状立体配線に単色LEDペアチップを配線に接着した表示板の側面断面図を表すものである。

【図3】図3は、マトリックス回路基板の表面にLEDペアチップを搭載し裏面にLED駆動用の基板を貼着しワイヤーにより電気的に接続したLED表示用モジュールの側面断面図である

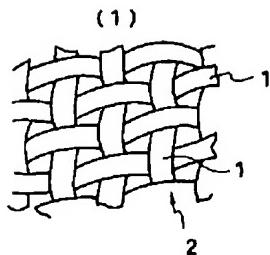
【図4】図4の(1)は、図3のワイヤーによる接続をコネクターで行った例、(2)は、金属バンブで行った例のそれぞれ側面断面図である。

【図5】図5は、従来の表示板を表す側面断面図である。

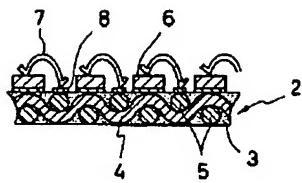
#### 30 【符号の説明】

- 1 絶縁被覆金属導体線
- 2 平織り網目状立体配線
- 3 絶縁剤
- 4 アノードまたはカソード側配線
- 5 カソードまたはアノード側配線
- 6 発光ダイオードペアチップ
- 7 ワイヤー
- 8 ボンディングパッド
- 9 表面電極
- 10 表面導電部
- 11 スルーホール
- 12 絶縁基板
- 13 駆動用基板
- 14 駆動素子
- 15 ワイヤー
- 16 コネクター
- 17 金属バンブ

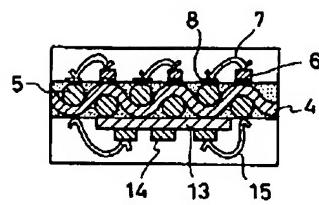
【図1】



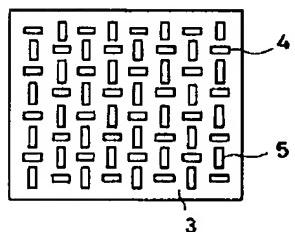
【図2】



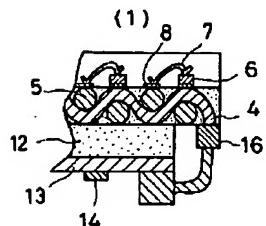
【図3】



(2)



【図4】



【補正方法】変更

【補正内容】

【0029】

【発明の効果】以上のとおり本発明によるマトリックス回路基板は、スルーホール等無しで容易に作ることができ、しかも該回路基板はフィラーを含浸することで放熱性が向上し、また金属導体線である銅線の直径を大きく

することで通常用いられる銅箔回路よりも電気抵抗が小さくでき、さらに駆動回路を裏面に貼着することで、例えばLED表示板用のマトリックス回路基板として、安価で輝度のバラツキが小さく、しかも放熱性が良好で小型なLED表示用モジュールや印字用ボード回路としての機能部品を得ることができる。

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**